

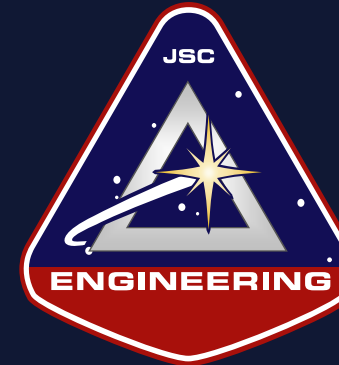


Johnson Space Center Engineering Directorate
**L-8: Advanced Vehicle Mobility – Good for Mars,
Great for Earth**

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Lucien Junkin
November 2016



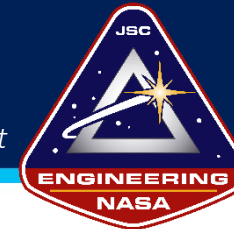
JSC Engineering: HSF Exploration Systems Development



- We are sharpening our focus on Human Space Flight (HSF) Exploration Beyond Low Earth Orbit
- We want to ensure that HSF technologies are ready to take Humans to Mars in the 2030s.
 - Various Roadmaps define the needed technologies
 - We are attempting to define our activities and dependencies
- Our Goal: Get within 8 years of launching humans to Mars (L-8) by 2025
 - Develop and Mature the technologies and systems needed
 - Develop and Mature the personnel needed
- We need collaborators to make it happen, and we think they can benefit by working with us.

EA Domain Implementation Plan Overview

JSC Engineering: HSF Exploration Systems Development



- Life Support
- Active Thermal Control
- EVA
- Habitation Systems

- Human System Interfaces
- Wireless & Communication Systems
- Command & Data Handling
- Radiation & EEE Parts

- Lightweight Habitable Spacecraft
- Entry, Descent, & Landing
- Autonomous Rendezvous & Docking
- Vehicle Environments



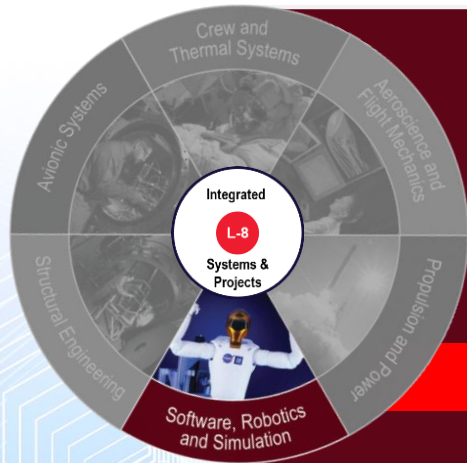
- Entry, Descent, & Landing
- Autonomous Rendezvous & Docking
- Deep Space GN&C

- Reliable Pyrotechnics
- Integrated Propulsion, Power, & ISRU
- Energy Storage & Distribution
- Breakthrough Power & Propulsion

- Crew Exercise
- Simulation
- Autonomy
- Software
- Robotics

AA-2 | iPAS | HESTIA | Morpheus

Software, Robotics, & Simulation Opportunity



- Crew Exercise
- Simulation
- Autonomy
- Software
- Robotics

The Problem

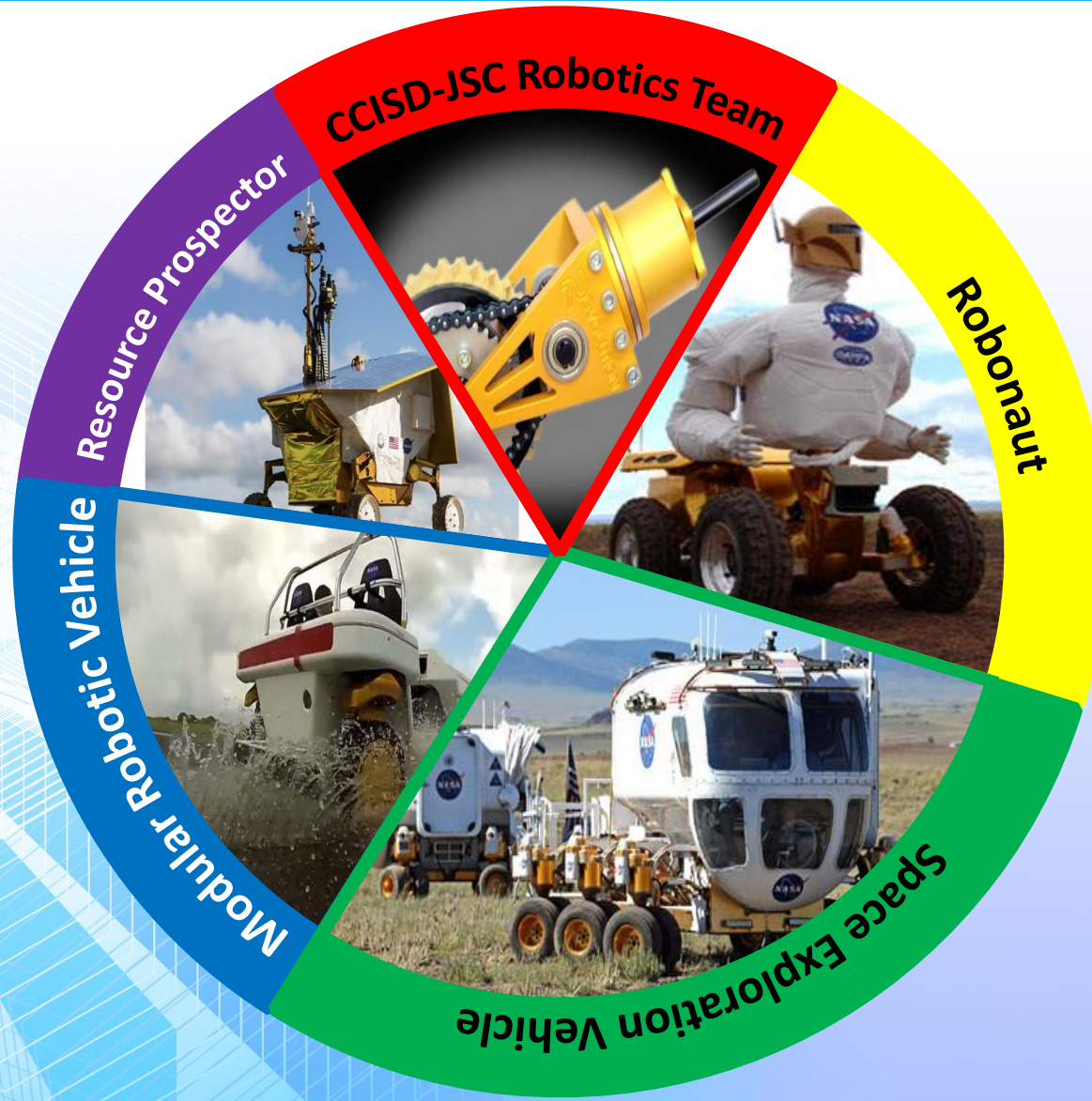
NASA is developing human rovers, also known as Space Exploration Vehicles (SEV), for The Moon and Mars. These rovers will be "Offroading RVs for Moon & Mars." There are many, many technical challenges that NASA faces in development of these vehicles. Some of the challenge areas include batteries, energy management, wheels, life support, radiation protection, and thermal control.

Advanced Vehicle Mobility – Good for Mars, Great for Earth

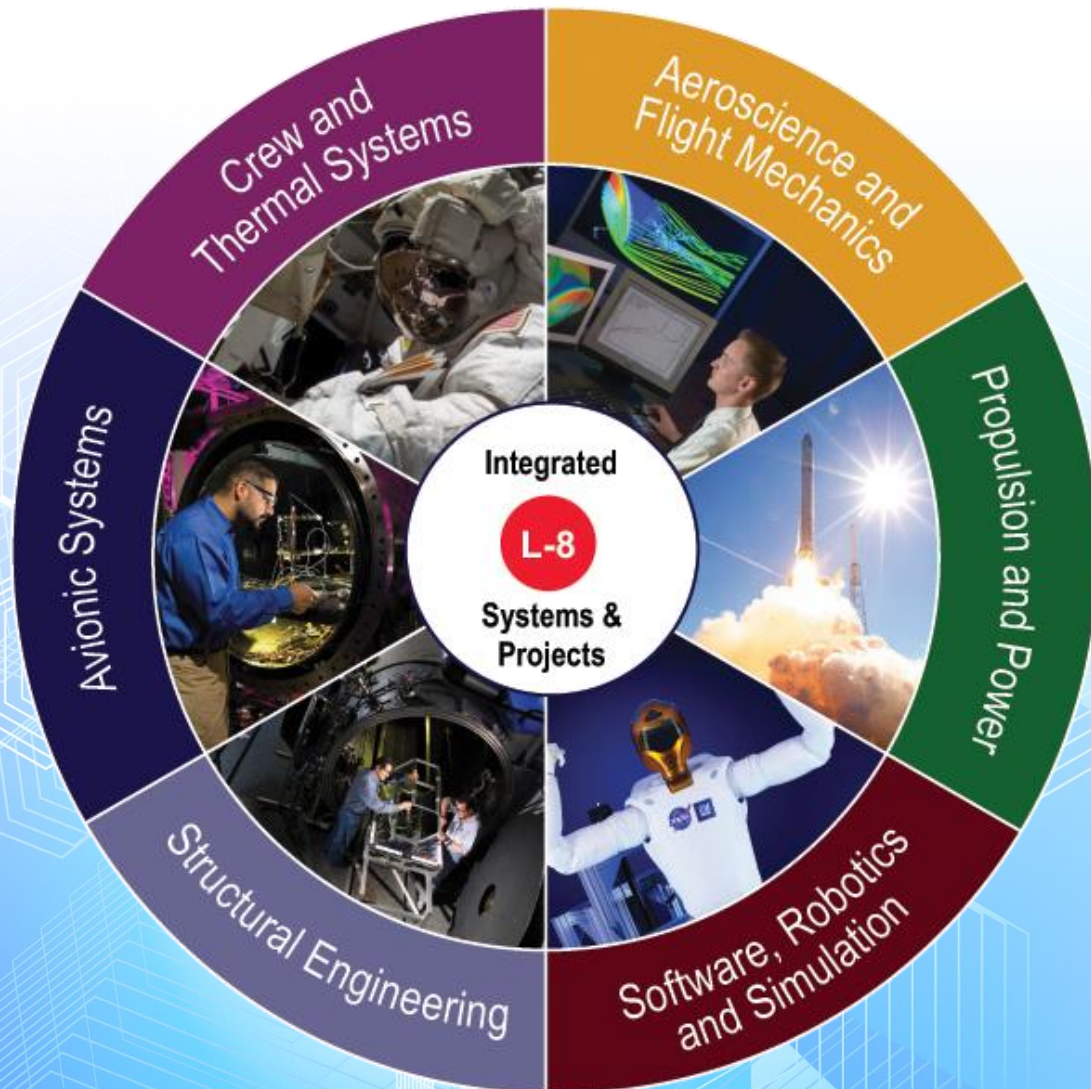
- *NASA has*
 - *Developed a Moon & Mars rover prototype currently in use for requirements development at the NASA Johnson Space Center*
 - *Developed a prototype small "car" with an industry partner with the same advanced mobility as the rovers that includes technologies needed for the Space Exploration Vehicles (SEV)*
- *NASA desires to*
 - *Share NASA's advanced mobility technology (steer by wire, driving algorithms, mechanical architecture, safety, etc.) with industry*
 - *Partner with industry to create the next vehicle using advanced mobility that allows NASA to advance the needed technologies for the SEVs AND produces a vehicle that is valuable to NASA's partner*

History of "Crab Steering" at NASA-JSC

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 - [Pointer to Co-Dev Announcements](#)
 - [Pointer to intake site](#)